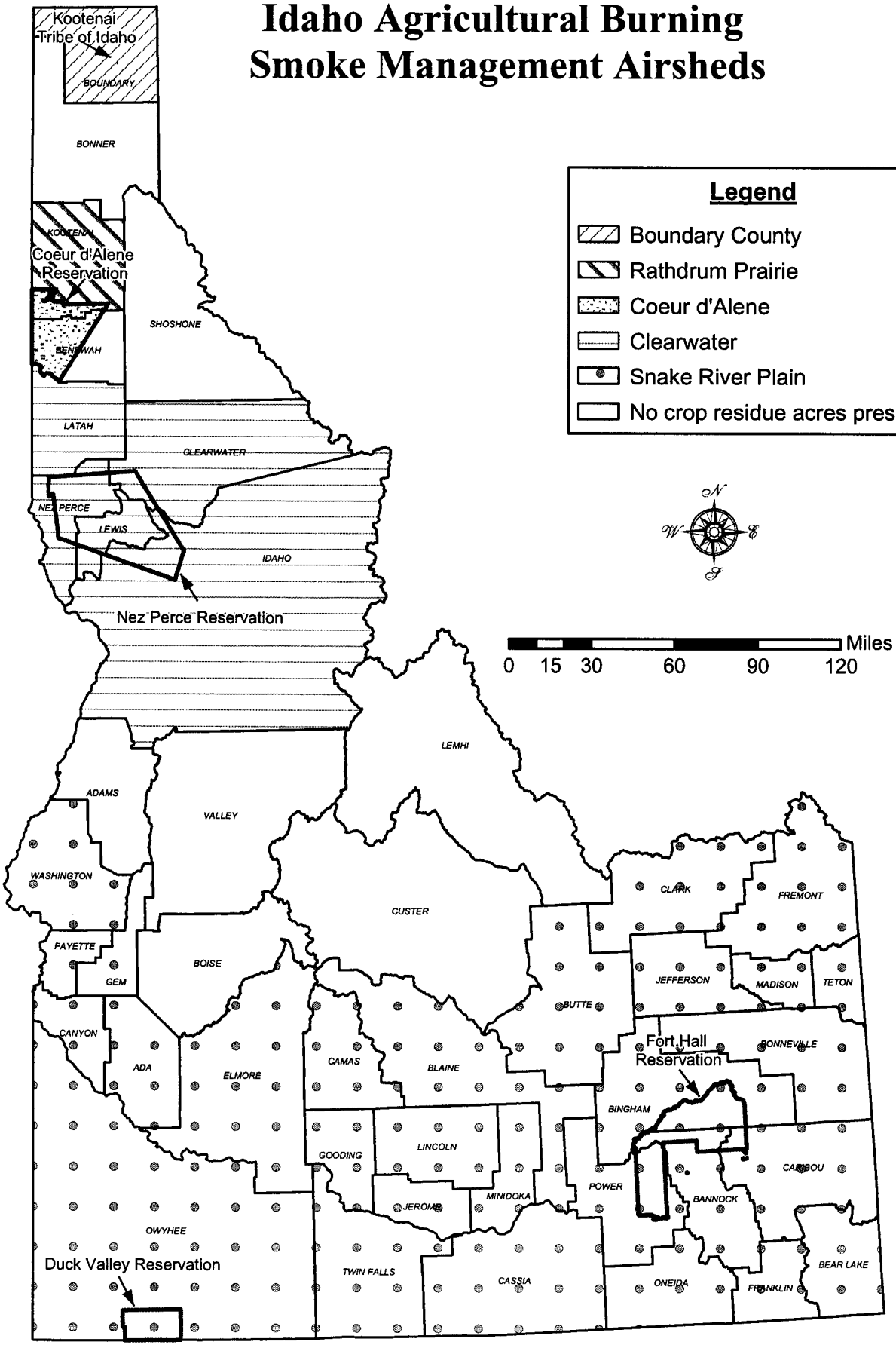
Idaho Crop Residue Disposal Smoke Management Program 2003 Season Review

Prepared by the Idaho State Department of Agriculture
in cooperation with:
Idaho Department of Environmental Quality
Nez Perce Tribe
Coeur d'Alene Tribe
Kootenai Tribe of Idaho

Idaho Agricultural Burning Smoke Management Airsheds



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Abstract[1]

The 2003 Crop Residue Disposal/Smoke Management Program (SMP) was administered and operated through the cooperation of several agencies and tribal governments including Idaho State Department of Agriculture (ISDA), Idaho Department of Environmental Quality (IDEQ), Nez Perce Tribe, Coeur d'Alene Tribe, Kootenai Tribe of Idaho, and the US Environmental Protection Agency (EPA). While individual agencies and governments have their own specific regulations, ordinances and rules, the overall purpose of the SMP is to allow Idaho farmers to maintain the essential tool of fire while minimizing the impact on Idaho citizens from smoke generated by crop residue burning.

The ISDA's peak crop residue disposal season began on July 22, 2003 and continued through the end of October. The starting date for the ISDA's peak season began following Director's issuance of the required Economic Determination. The peak burn season began a week earlier, July 14, on the Coeur d'Alene and Nez Perce Reservations. The Nez Perce Tribe and Coeur d'Alene Tribe are not subject to the ISDA director's determination.

Coordination within and between agencies was an important factor of the program this season. Operating procedures representing the coordinated input of all parties were in place, and personnel for each of the major airsheds in northern Idaho were hired and trained in advance of the peak burning season. In partnership with the Nez Perce Tribe, a contractor was hired to provide a daily dispersion forecast and burn recommendation. The smoke dispersion model, ClearSky, was expanded to include the Clearwater Airshed for 2003. Conference calls involving all agencies were conducted twice each day to share information and to make localized daily burn decisions.

The ISDA received a grant from EPA to increase public awareness and to conduct public outreach. Improvements were made to ISDA's website and a contractor was hired to provide a toll-free complaint hotline. Problems involving the State's computer network during the season were a major issue as they interfered with the ISDA's website. The complaint line established by ISDA and Nez Perce Tribe provided useful feedback to program personnel regarding the public's opinion of the SMP. Last season's (2002) annual summary reported a total of 1,386 complaints from northern Idaho. In 2003, the complaint line received 609 complaints. This correlates to a 56% decrease in the number of complaints received by the hotline.

Wildfire smoke became an issue during the 2003 season because it affected air quality. To address this and other air quality issues, IDEQ has the authority to issue a burn ban when certain air quality parameters and weather patterns occur. IDEQ adopted a short-term (1-hour) pollutant concentration to invoke burn bans before the 24-hour standard was threatened. After evaluating weather conditions, the strength and location of wildfires, and the patterns of impacts that were occurring, IDEQ issued burn bans for specific airsheds when smoke from local wildfires was either impacting or predicted to impact the airshed. This issuance of burn bans in some areas delayed the completion of field burning. Other areas were not significantly delayed by burn bans.

Evaluation of the SMP is based on the following criteria: public satisfaction, grower satisfaction, acreages burned, air quality maintenance, and adherence to standards set forth by agencies within the program. SMP coordinators received many comments from the agricultural community and, in general, satisfaction was expressed. However, there was still concern expressed by members of the public. There was a decrease in the number of complaint calls received by the SMP complaint line.

Suggested improvements for the 2004 season include, but are not limited to: hiring of additional field coordinators, purchasing better field equipment, revising the Technical Guidance document for the Tier II airsheds, hiring a local meteorologist to lend an expert and focused opinion to the daily burn calls, making public outreach methods more effective, and better refining the conference call and burn decision process in general. Additional improvements are included in the individual airsheds sections.

[1] This Season Review will be followed by a technical report which is currently being compiled by the SMP group.

Definitions

Airshed: A geographic area which, because of topography, geography, meteorology and climate, contains the same air mass. There were five airsheds for the 2003 season in Idaho. Each airshed has its own specific smoke management needs and goals.

Burn Bans: Different agencies have various authorities for issuing burn bans. The Idaho Department of Lands regulates fire safety. IDEQ has responsibility to regulate air quality standards outside of Indian Country (as defined by Federal Law). IDEQ has adopted a 1-hour PM2.5 concentration of 80 $\mu g/m^3$ as one of the criteria used for triggering burn bans (consideration must also be given to weather and air quality conditions, as well as source parameters). ISDA adopted a 1-hour PM2.5 concentration of 64 $\mu g/m^3$ (80% of 80$\mu g/m^3$). ISDA ceases all crop residue disposal burning when PM2.5 concentrations in an area exceed and are predicted to remain above this level.

Burn Calls: The decision for each airshed that determines the number of acres allowed to burn, the time of day at which burning can occur, and the extent to which field burning must be observed by the local coordinator. The burn call is made with input from the entire group and the local coordinator in order to balance local conditions with regional forecasts. A preliminary decision is made in the afternoon for the next day. The burn call can be changed the next morning during the final decision, depending on improved or deteriorating weather conditions, but the amount of approved acreage cannot be increased. These decisions are made via conference call and are based on the most updated meteorological data available at the time of the call.

Local Coordinator: Each airshed is managed by one or more local coordinators who oversee crop residue burning in that area. These coordinators use meteorological data as well as input from the SMP group to make a daily burn call. The coordinators are then responsible for contacting growers who have requested to burn and making sure they burn according to procedural guidelines. Each coordinator is in regular contact with the SMP group and keeps the group updated on the status of burning in his/her area. Local coordinators also provide administration and enforcement of burn requirements for their areas and are responsible for conducting investigations of alleged violations.

National Ambient Air Quality Standards (*NAAQS)*: Health based standards that are established by EPA for six criteria pollutants including particulate matter (PM). These standards are designed to provide an adequate margin of safety for the general public.

PM2.5: Particulate matter less than or equal to 2.5 microns in diameter. PM2.5 particles have been shown to cause health and environmental effects. Smoke from crop residue disposal contains particles that generally fall into this size category. PM2.5 concentrations are a good measure of smoke impacts. Higher PM2.5 values correlate to poorer air quality. The NAAQS for PM2.5 is 65 $\mu g/ m^3$ for a 24-hour period.

Registration and Burn Requests: Under state law, growers are required to register and submit requests to burn their fields at least twenty-four hours in advance. The registration process involves filling out a form with contact information and the legal description and location of each field. In some areas a $1 per acre fee is also required. Once fields are registered, the grower must then call his/her local coordinator to request to burn.

SMP: The coordinated crop residue disposal smoke management program in Idaho. This term includes personnel, plans, components, parties, or any other aspect specific to the program.

Tier: Tier I and Tier II programs are designed after the 1999 recommendations by the United States Department of Agriculture's Agricultural Air Quality Task Force. The Tier I program is for areas where burning rarely causes or contributes to air quality problems. The Tier II program is for areas where burning can contribute to air quality problems.

Introduction:

Background
The SMP in Idaho has changed considerably in the past few years. It has grown from an informal voluntary program to a multi-agency coordinated program. Idaho's SMP is based on the cooperation of federal, tribal, state, and private organizations working together to balance local and regional smoke management needs.

In order to improve SMP effectiveness in 2003, the state has been divided into two tiers and five airsheds. Tier I contains the Snake River Plain airshed, and Tier II contains the airsheds of Boundary County, Rathdrum Prairie, Coeur d'Alene Reservation, and Clearwater. Each of these airsheds is discussed briefly in this report.

Authorities
The ISDA is responsible for regulating disposal of crop residue under Title 22, Chapter 48, Idaho Code, for all areas within Idaho except for Indian Country. Idaho Code §22-4801 authorizes the director of the ISDA to promulgate rules related to crop residue disposal. These rules are codified at IDAPA 02.02.16.000 et. seq. ISDA works closely with the Idaho IDEQ, the Coeur d'Alene Tribe, the Nez Perce Tribe, and the Kootenai Tribe of Idaho to meet two overall goals for the crop residue disposal and smoke management program, which are outlined in the "Technical Guidance: Meteorological Services and Field Coordinators" document published by IDEQ:

1. Minimize the impact on Idaho citizens from smoke generated by crop residue disposal.

2. Maintain the essential tool of fire in the best management practices "toolbox" for Idaho farmers.

The IDEQ has the responsibility to safeguard air quality and limit and control the emissions of air contaminants outside of Indian Country. Idaho Code 39-105(3)(d). To carry out these responsibilities, IDEQ has adopted rules such as the open burning rule and the air pollution emergency rule. State statute also directs IDEQ and ISDA to cooperate with local communities and the agricultural community to establish smoke management and crop residue disposal programs. Idaho Code §22-4801.

The Coeur d'Alene Tribe regulates agricultural field burning within the boundaries of the Coeur d'Alene Reservation pursuant to the Coeur d'Alene Tribal Law and Order Code and Tribal Resolutions. The Tribe has operated its own SMP since the late 1980s. In 2002, the Tribe entered into a Memorandum of Agreement (MOA) with IDEQ and the ISDA in order to coordinate the Tribe's SMP with the SMP for the Rathdrum Prairie in Kootenai County and the statewide program.

The Kootenai Tribe of Idaho has responsibility for managing agricultural smoke on Indian owned lands within Boundary County. A Tribal Ordinance establishes identical rules and regulations as those implemented by the ISDA, giving the ability to manage crop residue disposal on those lands in a manner consistent with other lands in Idaho. An MOA to better coordinate State-Tribal activities is being established between ISDA and the Tribe

The EPA currently has authority to implement the Clean Air Act within the exterior boundaries of the Nez Perce Reservation and has established a cooperative agreement with the Nez Perce Tribe to develop and implement an SMP for the Reservation. The Nez Perce Tribe, EPA, IDEQ, and ISDA have entered into a MOA to have the ISDA Crop Residue Disposal Rule and the IDEQ Emergency Episode Criteria apply on the Reservation. In this way, the SMP can be coordinated uniformly throughout the Clearwater Airshed and burns can be authorized in parallel fashion to the state program.

2003 Season Improvements

Several improvements were made to the Smoke Management Program prior to the 2003 season as a result of experience and recommendations from the previous year. These improvements fall into six main categories: funding, training, air quality monitoring, tools, and public notification and outreach.

Funding: Increased funding, including EPA grants, cooperative agreements, and acreage registration fees, were used to help finance many of the improvements seen in the 2003 season.

Training: Tribal and state air quality staff attended forecasting training. Local smoke coordinators and other smoke management personnel attended meteorological and technical training prior to the beginning of the peak burning season.

Air Quality Monitoring: Additional monitoring equipment was in operation. Three monitoring sites were fully operational on the Nez Perce Reservation, bringing the total number of sites in the Clearwater Airshed to six. Washington State University's Lab for Atmospheric Research also provided the use of radar sounding equipment (SODAR) at Reubens on the Camas Prairie that measured atmospheric dispersion characteristics. An air quality and meteorological station was made available in Boundary County.

Tools: Forecasting services and meteorological models were enhanced in 2003. The Washington State University ClearSky Smoke Dispersion Model used last year in the Rathdrum Prairie and the Coeur d'Alene Reservation was expanded to include the Clearwater Airshed. Twice daily dispersion forecasts were provided by a contract meteorology service and were used in addition to models such as MM5 and ClearSky to aid in the decision making process.

Public Notification and Outreach: The ISDA and the Nez Perce Tribe used EPA funding to improve their public outreach capabilities. ISDA broadcasted daily radio announcements and worked to improve its website. A toll free complaint hotline supported by ISDA and the Nez Perce Tribe provided daily burn updates to allow the public access to the most current field-burning information.

Additional improvements to the SMP for 2003 include:

- The development of a technical guidance document by IDEQ that outlines protocols for meteorological and forecasting services, local coordinators, and burn decision-making in each airshed.
- There was improved coordination between regional and local smoke managers
- An MOA was in place for the SMP in the Clearwater Airshed
- ISDA was given enforcement authority for regulating unauthorized burning outside of Indian Country in Tier II.
- The Kootenai Tribe of Idaho contributed monitoring capabilities and air quality analysis.

2003 Statewide Season Statistics

Due to the nature of the SMP in Tier I, specific information regarding numbers of acres burned and the number of complaints received is difficult to obtain. This is caused in part by the large geographic area encompassed by Tier I, the limited resources available to manage the area, and the lack of authority given to ISDA to enforce SMP protocol in the area. Because of this, and its status as a low impact area, the focus of this report will be primarily on the Tier II airsheds.

Acreages and Burn Days

Total Approved Burn Days Tier II: 58 (includes any day where burning was approved somewhere in the 10 northern counties)
Total Confirmed Burn Days Tier II: 53 (includes any day when burning actually occurred in at least one of the 10 northern counties between 7/14/2003 and 10/24/2003)
Total Acres Registered Statewide: 106,691. In order to streamline the registration process, growers were asked to register all the acres they thought might be burned. Many of these acres were not burned due to the changing needs of the growers later in the season.
Approximate number of Registered Acres Burned Statewide: 81,642
Crop Types: Due to the fact that there are several types of crop residue burned throughout the state, each with its own specific properties, it is important that these variations are represented. When growers register their fields, they indicate the type of crop residue being disposed of. The following tables show the breakdown of which types of crops are registered in each area of the state. "Other" refers to various crop types such as mustard seed, alfalfa seed, pea plant stalks, etc.

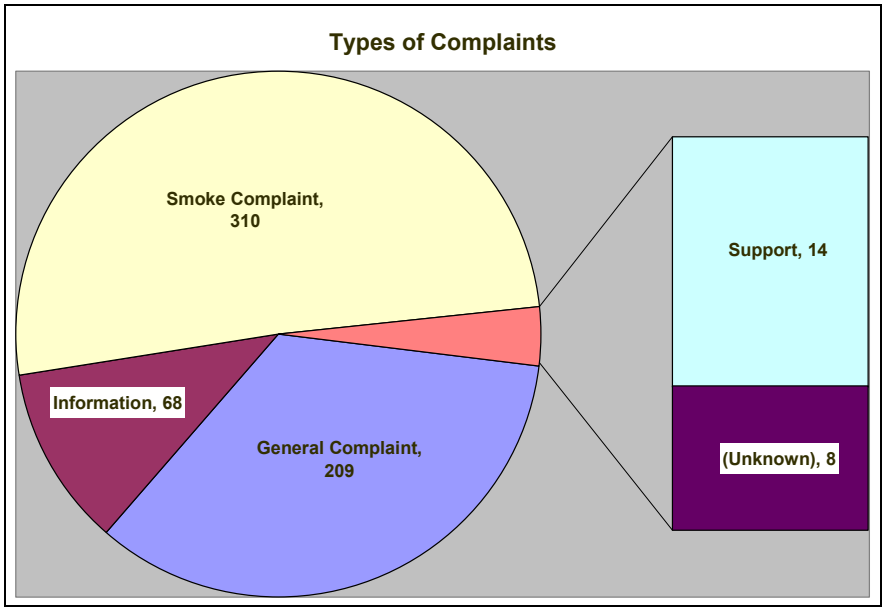
Acres Registered By Crop Type for Tier I

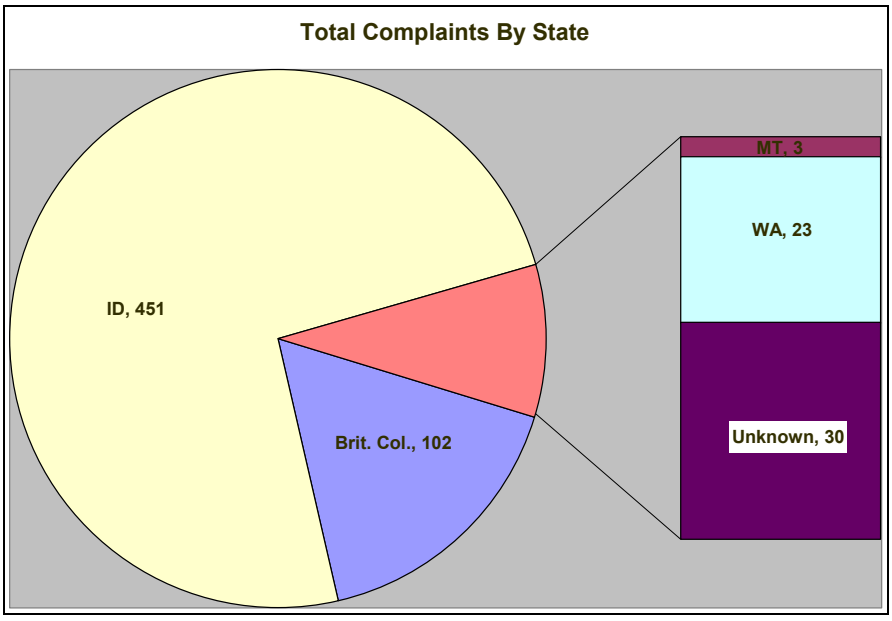
	Field Type				
County	Turf Grasses	Cereal Grain	Field And Forage Grasses	Other	Total
Ada	9	25	163		197
Canyon	131.7	359.59	550.5	354	1395.79
Cassia		855			855
Gem	172.1	85	40	72	369.1
Gooding				7	7
Jerome		340	268		608
Lincoln		450			450
Owyhee	71	115	25		211
Payette				38	38

Acres Registered By Crop Type for Tier II

	Field Type				
County	Turf Grasses	Cereal Grain	Field And Forage Grasses	Other	Total
Benewah	7208.6	3200.7	195	915.8	11520.1
Boundary	511	5623	4653	245	11032
Clearwater	1579.8	2081.2	51		3712
Idaho	4209	4108.1	586	227	9130.1
Kootenai	16206.8	677.3	657	104	17645.1
Latah	9630.2	3945.9	1548.8		15124.9
Lewis	9826.6	9034.9	1105.4	139.2	20106.1
Nez Perce	7705.9	5401.5	498.27	281	13886.67

Complaints:
A toll-free number was provided by ISDA and Nez Perce Tribe to log and receive complaints for the Tier II airsheds. In order to make the best use of the data gathered from complaint calls, the calls have been sorted into five categories: Unknown, General Complaint, Smoke Complaint, Information, and Support. Any call that did not have a comment attached is categorized as "unknown." These are included to show the entire bulk of calls received during 2003. A general complaint includes any call where the caller expressed disagreement or concern with the SMP as a whole, for example "I don't think farmers should be burning their fields because of the fire danger." A smoke complaint includes immediate and specific concerns with current air quality in an area, for example, "The air outside my house is full of smoke. I can't breath…" Information calls include questions or requests for information regarding when and where burning was occurring or general questions about the program, for example "Where is burning going to happen today?" Support calls include comments that support the goals of the SMP or express opinions favoring growers or burning. It should also be noted there were a small number of calls were made directly to agencies and tribes rather than to the hotline. These calls are not included in these charts.





Air Quality Management and Analysis

A summary of air quality management and analysis is provided below for the Tier II Airsheds. Air quality this season was impacted by both wildfire and crop residue disposal. A monitor was considered to be impacted by field burning if the wind data supported smoke movement from known field burning toward the monitored area and the PM2.5 levels rose above the criteria defined by ISDA and IDEQ. Air quality concentrations have been compared to 1-hour PM2.5 criteria (see "Burn Bans" under Definitions and Descriptions). While these levels were at times exceeded, the air quality criteria specified under the ISDA and IDEQ rules did not warrant issuance of any burn bans due to agricultural burning. However, IDEQ did issue burn bans due to regional wildfire activity.

Clearwater Airshed

The Nez Perce Tribe, ISDA and IDEQ staff kept notebooks of direct observations during the burning season at various locations. Nez Perce Tribe and IDEQ air quality staff performed an analysis of those notes and the ambient monitoring data. The Nez Perce Tribe provided an analysis of surface and upper level wind speed and direction. A summary of those analyses follows. There were 48 days when agricultural fields were burned in the Clearwater Airshed. The burning season extended from mid-July until late October. Daily acreage burned ranged from a low of 15 to a high just under 6600 acres.

Air quality monitors are maintained by the Nez Perce Tribe and IDEQ at six sites across the airshed. Air quality data were reviewed on a daily basis throughout the burn season. The air quality monitoring data showed significant impacts (in excess of 64 $\mu g/ m^3$) from some of the field burns. There were also days when significant acres were burned with minimal air quality impacts. Assessment of field burning impacts was complicated by the number of wildfires in the region during the field burn season.

Of the 48 burn days, nine days showed impacts measured by local air quality monitors in excess of ISDA's operational rule (64 $\mu g/ m^3$); of those, four days exceeded the one-hour PM2.5 criteria adopted by IDEQ. IDEQ issued several burn bans and health advisories due to regional wildfires. However, the air quality criteria specified under the ISDA and IDEQ rules did not warrant issuance of any other burn bans. Of the nine days just mentioned, three days were primarily impacted by wildfire smoke. The table below summarizes each burn day and lists the highest monitor reading for that day, along with complaint calls to the hotline for the Clearwater Airshed. There were also several days when the maximum 1-hour readings were elevated to between 40 and 60 $\mu g/m^3$. These levels do not exceed either of the one-hour PM2.5 criteria set forth by IDEQ or the SMP, however, these elevated levels are closely considered when deciding whether to continue field burning on a given date.

The 2003 field burning season in the Clearwater Airshed brought many improvements to the SMP. There were 4 additional monitors, more staff to coordinate operations, and better technological tools to use. The local SMP operations showed the ability to manage field burning respectful of air quality protection. However, Grangeville was more impacted this year than last (one time in 2002, 3 times in 2003 above 64 $\mu g/m^3$). There was also concern about the impacts to Kamiah and Reubens on field burning days (2003 was the first year of continuous monitoring in these two communities). Both the Nez Perce Tribe and IDEQ are conducting more critical, in-depth analyses of the season's meteorological and air quality data. The results of these analyses will be used to help improve SMP operations for next year.

Burn Day	Acres Burned	Max.1-hr PM2.5 Conc. ($\mu g/m^3$)	Hour Ending Time Period PST	AQ Monitoring Site	Complaints Received by Hotline
Wed., July 16	73	18	2 pm	Grangeville	0
Tue. July 22	71	40	4 pm	Grangeville	0
Wed. July 23	465	38	12 pm	Grangeville	0
Thurs July 24	536	78	2 pm	Kamiah	0
Fri. July 25	683	65	2 am	Kamiah	2
Mon. July 28	638	20	11 am	Lewiston	0
Tue. July 29	15	38	12 pm	Kamiah	0
Wed. July 30	569	61	11am	Kamiah	0
Thur. July 31	1156	37	7am	Moscow	0
Fri. Aug. 1	365	84	11am	Kamiah	5
Wed. Aug 6	1901	82	11am	Grangeville	1
Thur. Aug 7	1780	78	11am	Grangeville	1
Fri. Aug. 8	571	50	1pm	Grangeville	1
Mon. Aug. 11	996	35	4pm	Kamiah	2
Tue. Aug. 12	811	41	11am	Grangeville	0
Wed. Aug. 13	456	47	11am	Grangeville	0
Thurs. Aug 14	1190	70	2pm	Reubens	0
Mon. Aug. 25	235	26	12pm	Lewiston	0
Tue. Aug. 26	1515	44	2pm	Grangeville	1
Wed. Aug 27	3985	90	7am	Grangeville	4
Fri. Aug. 29	345	48	8am	Moscow	1
Wed. Sept. 3	103	50	4pm	Lewiston	7
Thur. Sept. 11	191	12	12pm	Lewiston	1
Fri. Sept. 12	1095	6	8pm	Moscow	1
Mon. Sept. 15	6576	61	5pm	Kamiah	3
Tue. Sept. 16	430	10	10am	Lewiston	0
Thur. Sept. 18	1892	9	2am	Grangeville	0
Fri. Sept. 19	3217	12	3pm	Grangeville	0
Mon. Sept. 22	1922	33	8pm	Kamiah	1
Tue. Sept. 23	2481	20	12pm	Lewiston	2
Thur. Sept. 25	2232	23	12pm	Lewiston	0
Fri. Sept. 26	427	18	11am	Lewiston	1
Mon. Sept. 29	1221	21	3am	Grangeville	0
Wed. Oct. 1	184	26	11am	Lewiston	0
Thur. Oct. 2	589	24	2pm	Moscow	0
Mon. Oct. 6	1589	35	2pm	Kamiah	1
Tue. Oct. 7	897	17	6pm	Grangeville	2
Wed. Oct. 8	542	17	11am	Lewiston	0
Fri. Oct. 10	102	13	8am	Moscow	0
Tue. Oct. 14	51	8	12pm	Moscow	0
Wed. Oct. 15	50	13	5am	Moscow	0
Fri. Oct. 17	20	16	11am	Lewiston	0
Mon. Oct. 20	723	20	8pm	Lewiston	0
Tue. Oct. 21	339	39	11pm	Kamiah	1
Wed. Oct. 22	979	76	10pm	Kamiah	0
Thur. Oct. 23	130	94	12am	Kamiah	0
Fri. Oct. 24	168	10	12pm	Lewiston	0
Mon. Oct. 27	264	49	8pm	Lapwai	0

Rathdrum Prairie, Kootenai County

There were seven burn days in which fields were ignited on the Rathdrum Prairie. The daily burn acreage ranged from a low of a seven acre test burn to a high of 1,603 acres. All the burning on the Rathdrum Prairie was completed during the month of August. Field observations by IDEQ were made on four of the burn days at various locations. On some occasions, IDEQ staff visually observed smoke drift back down to the ground at some distance downwind from the point of ignition, or that was transported by surface winds at ground-level from the burn location. Based on the number of calls received, there were fewer complaints than previous years. Also, the magnitude of the measured downwind impacts associated with field burning smoke is lower this year than measured impacts from field burning in previous years. Greater oversight, more careful evaluation of weather conditions, and limitations on acres burned per day contribute to these measurable changes.

Air quality data were reviewed on a daily basis throughout the burn season. Air quality was monitored at seven locations that were either adjacent to or downwind of the Rathdrum Prairie. The air quality monitoring data showed some downwind smoke events from the field burns most notably at the Athol site. The degree of impact was variable but coincided with timing of burns on the Rathdrum Prairie and downwind movement of the smoke plume. The measured 1-hour PM2.5 concentrations did not exceed IDEQ's criteria but did exceed ISDA's criteria on three occasions. However, the air quality criteria specified under the ISDA and IDEQ rules did not warrant issuance of any burn bans.

Not all areas which experience smoke events have access to monitor data and PM2.5 levels. Although monitoring data is the only way to accurately document smoke concentrations and the criteria levels that govern air quality standards, it does not provide a complete picture of smoke events in areas where this data is unavailable. On certain occasions, and by trained personnel, monitoring data can be supplemented with other information such as visual observations. Though these observations cannot be used to determine if air quality criteria levels are violated, they do help SMP personnel understand smoke behavior and prevent future impacts. For example, IDEQ staff conducted routine field visits during the burn season. During one such visit on August 19, DEQ staff visually observed a smoke plume originating from a burn site and followed the plume downwind. DEQ observed the smoke settle onto Lake Pend Oreille and into communities to the north, including Athol and East Hope. The monitor in Athol showed elevated 1-hour readings (see table below). While there was a monitor in East Hope, it was not working properly at the time and thus no smoke concentration levels were recorded.

The table below summarizes the eight burn days on the Rathdrum Prairie, PM2.5 levels on these days, and the number of complaint calls made to the hotline.

Burn Day	Acres Burned	Max. 1-hour PM2.5 Conc., $\mu g/ m^3$	Hour Ending Time Period, PST	AQ Monitoring Site	Complaints Received by Hotline
Wednesday August 6	117	29	3 pm	Athol	18
Monday August 11	385	17	8 pm	Coeur d'Alene	55
Tuesday August 12	815	69	2 pm	N. Hayden	94
Tuesday August 19	1603	71	1 pm	Athol	7
Wednesday August 20	7 *test burn*	49	1 pm	Athol	4
Monday August 25	494	70	2 pm	Athol	22
Tuesday August 26	381	53	8 pm	Coeur d'Alene	19

Boundary County

The Kootenai Tribe of Idaho is working collaboratively with ISDA and providing air quality and meteorological information for the Kootenai River Valley Airshed in Boundary County, Idaho. The Tribe, in partnership with IDEQ, operates an air quality monitoring station located on the reservation, three miles west of Bonners Ferry. The station provided real-time data that was available to ISDA either by dial-up access or upon request from the Kootenai Tribe. The information that was available from the station included particulate matter (PM2.5) concentrations, ambient temperature at three and ten meters, wind speed, and wind direction. Technical difficulties precluded ISDA from being able to use the dial up access option so air quality information was generally provided to the program over the phone or by email.

There were 18 days in Boundary County when crop residue disposal took place. Complaints were received on 21 days during the season, with the largest number of complaints occurring on August 15th. There was no crop residue burning on this day, although it had been designated as a burn day by the SMP. The acreage burned in 2003 ranged from seven to 1573 acres and was generally well below the amount that was approved in the burn call. IDEQ issued health advisories on two of the days with the largest burned acreages. However, the air quality criteria under the ISDA and IDEQ rules did not warrant issuance of any burn bans. Air quality data was reviewed by ISDA prior to making a burn call, at the time of the test burn, and during the field burning itself. However, an extensive review of the data following the burn, which would have been valuable for the purposes of validating the smoke calls, was not possible due to the Kootenai Tribe's air quality program's limited resources.

The air quality monitoring data showed that although complaints generally correlated with the air quality readings they did not necessarily correlate with burn days. In part this was due to the impacts from wildfires in the region. The Kootenai River Valley was heavily impacted by wildfire smoke from Washington State and Canada and many of the complaints attributed these impacts to crop residue disposal. In addition, the location of the monitor may have had an effect on the correlation of complaints with field burning. Many of the complaints came from British Columbia which is in the northern part of the airshed about 20 miles north of the monitor. The monitor was used as a tool to prevent smoke impacts on the Tribal population as well as the broader Kootenai Valley community. The monitor did not register high values during the time when fields upwind or adjacent to the reservation were burned. The Kootenai Tribe, IDEQ, and ISDA are working to resolve technical issues that will improve access to the real-time data during the 2004 season. This should assist with the daily burn decision-making process

Information about air quality in Boundary County can be found in the following table. This table gives the date, acres approved and acres burned, general location of the field or fields, time and value of the highest PM2.5 concentration, and the number of complaints that were received by the hotline. Note that on September 19, 200 acres were burned on Kootenai National Wildlife Refuge (KNWR), which is not participating in the Smoke Management Program.

Date	Acres Approved/ Acres Burned	Location Of Field Relative To The KTOI Monitoring Site	Max. 1-hour PM2.5 Conc. ($\mu g/m^3$)	Hour Ending Time Period (PST)	Complaints Received by Hotline
7/31/03	(No burn)		N/A	N/A	1
8/1/03	(No burn)		21	8 am	1
8/7/03	(No burn)		9	7 am	1
8/11/03	300/120	North of Copeland	7	10 am	30
8/12/03	200/10	North of Copeland	7	12 am	39
8/13/03	115/35	North of Copeland	7	1 am	8
8/14/03	(No burn)		11	9 pm	4
8/15/03	100/0	No burning done	120	6 pm	31
8/19/03	300/80	North of Copeland	14	12 am	0
8/21/03	(No burn)		30	11 pm	4
8/22/03	(No burn)		36	5 pm	3
8/25/03	500/200	East side, N. of River	11	10 pm	2
8/26/03	1500/220	North of Copeland	27	9 pm	11
8/27/03	1500/7	No burning done	21	1 am	0
8/28/03	(No burn)		87	10 am	6
8/29/03	600/301	North of Copeland	41	1 pm	0
8/30/03	(No burn)		66	2 pm	2
9/2/03	(No burn)		47	12 pm	3
9/3/03	1900/1524	North of Copeland	47	2 pm	6
9/5/03	1700/1573	North and at Copeland	33	1 am	0
9/10/03	1000/358	North of Reservation	8	11 am	1
9/11/03	1000/304	East and also North	4	11 pm	0
9/16/03	1000/396	East and also North	6	7 am	0
9/18/03	600/379	South of KNWR	4	9 pm	0
9/22/03	1700/1400	North of Reservation and also near Canadian border	4	3 am	4
9/23/03	50/0	No burning done	7	8 am	2
9/25/03	50/50	North of Copeland	8	7 pm	0
9/29/03	600/554	West side, N. of KNWR	12	6 pm	0
10/3/03	50/0	No burning done	N/A	N/A	1
10/5/03	(No burn)		N/A	N/A	1

2003 Season Discussion of Issues, Solutions, and Recommendations

Operations and Protocol

Discussion

Prior to the start of the 2003 season, a set of protocols was developed by the SMP for meteorological services and forecasting services, local coordinators, and the burn decision making process for the SMP group. These protocols were published by IDEQ in a document "Technical Guidance: Meteorological Services and Field Coordinators." Many of these protocols worked, while others were shown to need improvement as the season progressed. The protocols that were found to need improvement include better defining local coordinator domains and coordination, forecasting models and their use, and the flexibility of burn calls. Other problems that did not have to do with protocol, such as wildfire smoke, were encountered this season as well.

Due to the complex terrain in the Clearwater Airshed the smoke management areas were divided among four field coordinators: three ISDA coordinators covering acreage outside of the Reservation boundaries and one Nez Perce Tribe field coordinator covering areas within the exterior boundaries of the Reservation. Fields north of the Clearwater River were in the northern Airshed limits and those south of the river were included in the southern limits. In the protocols these areas are respectively referred to as the Palouse (northern Clearwater Airshed) and the Camas (southern Clearwater Airshed) Prairies. Some confusion developed when fields north of the Clearwater River had to be worked into the burn limits of the Palouse but not managed by the respective field coordinator. This often resulted in field coordinators getting confused when dividing acreages with each other to meet burn limits. Defining a more detailed process of coordination in these areas needs further investigation.

One issue that became apparent throughout the course of the season was in regards to the forecasting models used by the SMP. The SMP team used a variety of tools each day to make the final burn decision. The team members reviewed various forecasting products available on the Internet for indices such as ventilation, mixing height and wind direction. The ClearSky dispersion model provided the team with predicted plume trajectories for certain airsheds. Some of the field coordinators also had access to local weather observations such as upper air wind speeds and direction through pilot balloons (Pi-bals) or SODAR. With limited meteorological training, the team members struggled at times to interpret the forecast products especially when different models were contradictory. As the season progressed, the field coordinators became more experienced at reconciling the forecasting tools with local conditions and identifying the products that worked best for their geographic area. Further work is needed to help develop and recognize forecasts that provide not only good smoke dispersion conditions but also appropriate conditions at the point of ignition to promote safe burning. In addition this daily burn decision process must be completed in a timely and efficient manner to meet tight time schedules and other program needs such as public relations.

There was confusion among some members regarding the flexibility of the burn calls from the preliminary to the final decision. Although the specifics for making preliminary and final burn calls were laid out prior to the season in the SMP protocol, what changes should and should not be allowed came into question during the season. Since the point of a preliminary burn call is to get word out to the public and farmers alike in ample time, it is important that there be consistency from the preliminary burn call to the final burn call. Issues encountered during the 2003 season will be considered when updating protocol for the 2004 season.

The final major issue that arose this season occurred when smoke from wildfires in Idaho and neighboring states began to degrade air quality during the field burning season. As the air quality in some of the airsheds deteriorated due to wildfire smoke, it became more difficult to approve burning in those airsheds. At certain times IDEQ was required to issue burn bans.

Recommendations

In order to improve the SMP operations and protocol implementation next year, several additional suggestions have been made and are outlined below. These improvements will help the program become more efficient and effective in meeting its goals.

- Revision of Airshed Protocols: In exercising the protocols from the Technical Guidance, three areas emerged that need refinement for 2004: acreage limits, field coordinator domains, and coordination between field coordinators. The process of making the daily burn decisions needs to be refined in SMP protocol for each airshed. Suggestions include having a check-list of specific tasks to be accomplished on each conference call, and better preparedness on the part of all parties prior to the conference calls.

- Personnel: One recommendation to improve the SMP next year is to hire more personnel. This recommendation is based on the problems experienced by the smoke coordinators from several airsheds this season. There were times when lack of local coordinators caused significant problems such as miscommunication, lack of time, lack of resources, and an excess of duties required of each local coordinator. By hiring more personnel, these problems can be significantly reduced. In following with this recommendation, ISDA is considering hiring additional personnel for Boundary County, and the Clearwater Airshed. The Nez Perce Tribe is proposing to hire addition personnel as well.

- Increased Monitoring and Forecasting Capabilities: It would be beneficial to have improved meteorological capabilities in Grangeville. Recommendations have also been made to install air quality monitors and/or meteorological equipment close to the Canadian border. Deploying air quality monitors and creating access to real-time monitoring data across the area would also be major improvements to the program. Additional improvements for the ClearSky model, such as harmonizing databases, expanding the domain of the model to include Boundary County and integration with other models, are necessary.

- Meteorologist: The third recommendation for 2004 season is to hire a meteorologist that will be dedicated solely to the SMP to make smoke-specific forecasts for use by the group. This season the SMP had access to numerous meteorological tools, however, while all personnel were experienced, none of the staff had in-depth expertise with these tools. If a local meteorologist were to join the SMP staff, disagreements regarding weather conditions could be deferred to an expert. The meteorologist would also provide the capability to diagnose a problem event and provide recommendations for improvement.

Public Relations

Discussion

Public Relations are a high priority for the SMP. The main objectives of SMP public relations are twofold; public awareness and grower outreach. The majority of the SMP's public relations efforts this season consisted of five items; daily radio announcements, website, complaint line, grower hotline, and grower workshops. It was hoped that between these five methods the growers and the public would be well informed about crop residue disposal in their area. While these methods were generally effective, there were also problems.

Daily radio announcements based on the preliminary burn call were sent out each afternoon to a contract broadcaster. This information was then pre-recorded and played the next morning at around 7:45 AM on several stations in order to reach the greatest number of people. On some days, due to deteriorating conditions or a decrease in acres requested, the final burn call was less than the preliminary call announced over the radio. Due to the constraints of timing required to set up the announcements, it was not possible to run an updated announcement of the final burn calls. However, in order to provide the most useful information to the public, it was decided in the burn protocols that the final approved acreage would not

exceed the preliminary approval. In this way the radio announcements avoided understating the burn acres for the day.

The ISDA's website was another major source of public information this season. The website received 1467 hits from August 20, 2003, to October 31, 2003. There were several benefits to having a website. However, there were also several issues which arose this season in regards to website access and organization. Some of these problems were resolved by modifying the website so the public and administrative sections could be managed separately. This allowed the ISDA to enter general daily burn information quickly and efficiently into the public website, while giving local coordinators more time and flexibility in regards to entering their more specific burn data. This seemed to work more effectively.

One major issue with the website was how well it relayed information to the public. There were complaints that the information was difficult to understand and hard to access, even though improvements to the webpage this year did include directions and a quick-reference text box in order to make navigation easier. There were several changes made to the layout of the website over the course of the season to alleviate confusion and simplify information. There was also an issue of accessibility. Due to problems with the State's server, there were several instances when the website was not accessible.

The other main source of public outreach was the complaint hotline. This system was established in such a way to accomplish three major objectives:

- To allow the entire SMP a holistic view of how smoke was affecting citizens in each area;
- To allow the SMP to receive real-time feedback regarding smoke impacts on communities; and
- To enable local personnel to respond to complaints in a timely manner.

The service was provided by ISDA and The Nez Perce Tribe through a contract with a private business that provided a toll free number for citizens to call in order to receive the most current burn information and/or leave a comment regarding crop residue disposal. Calls were received from a wide range of areas, including all of northern Idaho, eastern Washington, and British Columbia, Canada. Callers were given the option to listen to burn information or to speak with an operator. Comments or complaints were recorded as text and emailed to the Smoke Management group. If a caller requested a return call, the appropriate local personnel would contact them as soon as possible. The format of these complaint calls is shown in the following figure:

```
=====================================
Fri 17-Oct-03 03:03p amd  TAKEN
NAME::XXXX XXXXXXXXX
PHONE::(XXX)-XXX-XXXX
CITY::COER D'ALENE TRIBE          STATE::ID
COUNTY::KOOTENAI
PROBLEM::THE SMOKE
SPECIFIC.LOCATION.OF.BURNING.BEING...
REPORTED::NOT SURE
COMMENT::THERE ISNT SUPPOSED TO BE
BURNING TODAY IN HER COUNTY BUT SHE IS
GETTING ALOT OF THE SMOKE FROM OTHER
COUNTIES.
CALL.BACK.REQ::(Y):      (N):NO
REMAIN.CONFIDENTIAL::(Y):      (N):No
```

The main problem associated with the complaint line this year was the erratic and inconsistent nature of the emails provided to the SMP by the contractor. There were times when complaints were sent to certain parties of the SMP and not to others. There were also instances when complaints were not received for days at a time and then complaints for several days received simultaneously. This made it difficult to use these complaints as a reliable source of feedback or to return calls in a timely manner. This problem was

difficult to solve and persisted for much of the season. Since the complaint line was one of the most widely used forms of public outreach it is important that this problem does not happen in future seasons.

The grower hotline is a toll free number that connects growers to the main ISDA office in Boise. This hotline is used to help growers register and to answer questions or concerns they may have. The grower hotline also accepts calls from non-growers who have questions or complaints about the program. There were no significant problems with this resource during the 2003 season.

In addition to the grower hotline, workshops were given prior to the peak burning season in Tier II so that growers could learn about the SMP process and its requirements. These workshops were designed to educate growers in the practices of field burning and to inform them of their responsibilities. Topics covered at these meetings included the registration and request process prior to burning a field, best burning practices and how to burn properly, SMP agencies and their authorities, and air quality measurements and health impacts of smoke. These meeting were generally well attended with the exception of the Boundary County meeting. On the Rathdrum Prairie, growers continued to meet regularly during the burn season.

Recommendations

- Communications Subcommittee: In addition to the specific recommendations regarding problems with public outreach tools, an additional recommendation for next year is to focus and increase the public outreach efforts. This would entail forming a subcommittee of the SMP to oversee the implementation of broadcast, electronic, and printed media. By having a group of individuals dedicated to this task the SMP will be able to more effectively share its goals, rules, and interests with the general public as well as with growers.
- Radio Announcements: The effectiveness of the radio announcements needs to be further evaluated and discussed by the communications subcommittee. Changes and improvements to the radio announcements, including quality, timing, and accuracy will be addressed.
- Website: Some proposed changes for next year include having a more visually based web page, and providing the information in a simplified format. An expanded website with information about the program and its goals has been proposed.
- Grower Workshops: Expanding these workshops to more areas well before the burning season would greatly improve grower outreach.
- Convene advisory committees
- Complaint Hotline: Contract revisions are being considered with the service provider to improve service to both the SMP and to the public.

Conclusion

There were many improvements to the program this season which merit continuing support of the program by state, federal, and tribal agencies. Now in its third year, the program has shown continued improvements. Since its conception as a coordinated statewide program in 2001, focus has begun to shift from how to improve the SMP to how to maintain it as an effective and necessary function of state and tribal government. Discussion regarding future funding and long term plans for the SMP has been opened and it is hoped that the program will find continued support and improvement.

Airshed Summaries

Tier I:

Snake River Plain Airshed

Tier I is the region of Idaho comprised of the thirty-six counties south of Idaho County. Tier I is an area of minimal impact where crop residue disposal is not viewed as a significant problem. The main goal for this airshed is to spread awareness of the SMP while helping growers come in compliance with the rules and regulations of the program.

The main problems encountered in the Tier I area include unapproved burning and a lack of grower awareness. These two issues are caused by two main factors; geographic and regulatory. The large and sparsely populated area encompassed by Tier I makes it hard to efficiently inform growers of SMP rules and regulations. The lack of enforcement authority makes it difficult to regulate crop residue disposal in this area.

The measure of success for the SMP in this area is dependent on how well the goals for this area were met. While smoke impacts appeared to be minimal (based on available information), the cooperation and education of growers did not experience a significant improvement this season. It is obvious that the southern Idaho airshed--especially the areas outside of the Treasure and Magic Valleys--fall far below the expectations of Idaho's Smoke Management Plan. Once the SMP for Northern Idaho is well established, it is important that focus be given to this part of the state and that serious improvements are made.

Tier II Airsheds:

Tier II is comprised of the four northern airsheds: the Clearwater, Coeur d'Alene Tribe, Rathdrum Prairie, and the Boundary County. Tier II has a higher concentration of crop residue disposal acreages and a more complex geographical terrain. Combined with a relatively higher concentration of people, these attributes make it necessary to more closely monitor burning to avoid smoke impacts in Tier II. Some airsheds have additional objectives regarding the specific needs of the area.

Clearwater

The Clearwater Airshed generally includes the counties of Clearwater, Idaho, Latah, Lewis and Nez Perce. An MOA is in place between ISDA, IDEQ, EPA and the Nez Perce Tribe to coordinate SMP throughout the entire Clearwater Airshed so that procedures and protocols are generally uniform for all participants in the burn program.

For the purposes of managing burns and establishing acreage limits, the Airshed was subdivided into the Palouse and Camas Prairies. The Palouse Prairie covers the areas north of the Clearwater River and south of the Benewah and Shoshone county borders and includes areas on and off the Reservation. The Camas Prairie is situated south of the Clearwater River and also includes areas both on and off the Nez Perce Reservation. The area off the Reservation is managed by ISDA. The Nez Perce Reservation covers most of Lewis County, the northeast half of Nez Perce County, the southwest corner of Clearwater County, and the northwest section of Idaho County and a small southeast corner of Latah County. On the Nez Perce Reservation, EPA currently has authority to implement the Clean Air Act, and the Tribe operates the SMP on EPA's behalf through a cooperative agreement.

Burning occurred on forty-four (44) days on the Camas and (26) days on the Palouse Prairies this season. There were a total of 61,958 acres registered and 44,820 burned. On the Camas Prairie 13,560 acres were registered off-reservation, and of those, 8,609 were burned. On the Nez Perce Reservation, 33,274 acres were registered, and 25,323 burned. On the Palouse Prairie, there were 15,124 acres registered in Latah County. Of these, 10,888 were burned.

There were a total of 51 complaints in the Clearwater Airshed. Twenty complaints were received by the complaint hotline and the Nez Perce Tribe from the Camas Prairie (15 from Idaho County, 5 from Nez Perce County). Of these 20 calls, ten were general complaints, three were for information, and seven were smoke complaints. There were a total of 31 complaint calls received from the Palouse. Twenty-six of these were from Latah County, the remaining five complaints were from Pullman, Washington. Of these 31 calls, thirteen were general complaints, five were for information, and thirteen were smoke complaints.

Issues that arose for the Clearwater Airshed in the 2003 season included difficulty informing and registering wheat growers, the proximity of standing timber to fields, small acreages (which makes it hard to achieve proper smoke lifting), communicating effectively with the public and other agencies such as IDL, differences in the behavior of wheat versus grass smoke, confusion regarding coordination of acreage limits among local coordinators, and a generally increased fire danger. Several communities in the airshed experienced smoke impacts from field burning. *See supra* "Air Quality Management and Analysis" at page 8. Wildfire smoke also contributed to community impacts during the season.

In order to address these issues for the 2004 season, the following recommendations have been made: expanded and increased outreach efforts to help wheat growers be informed of the SMP rules and regulations, increased efforts to improve communication with IDL and other agencies, further analysis of the differences in types of smoke from differing crop types and their behavior, revision of field coordinator management areas and acreage limits. Other suggested improvements for next season include hiring more personnel and installing additional monitoring equipment. Improved public outreach is also necessary to provide more clear and consistent information. This would include establishing means of gathering better public feedback.

Coeur d'Alene Indian Reservation

The Coeur d'Alene Indian Reservation lies in both the northwest half of Benewah County and the southern section of Kootenai County, bordered on the west by the state boundary. Management of field burning in this area is provided by the Coeur d'Alene Tribe. Accomplishing the main SMP goals in this area require establishing policies and procedures to control and monitor crop residue disposal within the Coeur d'Alene Indian reservation, as well as enforcing those policies.

Burning occurred on 22 days in the Coeur d'Alene Reservation airshed this season. There were 25,047 acres registered within the reservation. Of these, 24,422 acres were burned. There were a total of twelve complaint calls received from areas within the reservation.

Considering the fact that smoke management has a long and successful history on the Coeur d'Alene Reservation, this year did not deter from that record. There were minimal complaints received from citizens on the reservation and growers were able to complete their burning in a timely and efficient manner. It is hoped that the continuing close work between Coeur d'Alene Tribe and ISDA will lead to continued improvements for the program. Discussion of ways to streamline the process of communication between the two agencies is under way. It is hoped that further refinements of the registration process will allow an increased efficiency in the process. In 2004, the Tribe will be collecting meteorological and PM2.5 data at Plummer as well as using a portable PM2.5 monitor during the field burning season in smoke sensitive areas.

Rathdrum Prairie

The Rathdrum Prairie growing area is bordered by the cities of Coeur d'Alene/Hayden to the east, the city of Post Falls to the south, the Idaho/Washington State border to the west and the City of Rathdrum to the North. Field burning in this area is managed by ISDA. The main goals in this area are those of the general SMP program. There are no significant secondary goals.

Burning occurred on seven days this season. There were 4,118 acres registered. Of these, 3,842 acres were burned. There were a total of 423 complaints regarding the Rathdrum Prairie received by the hotline. Of

these 423 calls, 127 were general complaints, 36 were for information, 248 were smoke complaints, and nine were in support of the program.

The Rathdrum Prairie Airshed is challenging due to the location of metropolitan areas that surround the major bluegrass seed producing fields. Therefore, efforts are conducted to ensure that smoke does not affect the larger metropolitan areas adjacent to the Rathdrum Prairie. The major concern for the Rathdrum Prairie is the relatively narrow smoke corridor due to the location of these surrounding communities. If smoke strays from this corridor, communities can be impacted. Because of the very narrow window available, wind speed and direction, as well as ventilation must be closely monitored and evaluated to ensure smoke does not stray out of the low impact corridor.

Recommendations for next season include new weather monitoring equipment and additional personnel to act as local coordinators. Grower education is not a large concern. Because the SMP has such a high profile in this area, growers are cooperative and willing to work within the constructs of the program. Improvements to the complaint line for next season are necessary for both the sake of the public and persons within the SMP.

Boundary County

Most of the crop residue disposal activity in Boundary County occurs in the Kootenai River Valley. ISDA has jurisdiction over most of the area with the exception of Indian owned lands in the Kootenai River Valley. However, the Kootenai Tribe of Idaho has enacted Tribal laws providing for identical rules and regulations as that of the State of Idaho for the management of the Smoke Management Program on Indian owned lands and provides air quality monitoring and meteorological information for the program. The Tribe and ISDA worked cooperatively throughout the season to assure that the needs of both parties were met and will continue this effort next year. This is the first year that the Boundary County area has been included in the Tier II grouping. Because of this, the goals for this area were twofold. The first was to raise awareness and foster a working relationship between local growers and the SMP. The second was to foster a cooperative working relationship with the Kootenai Tribe of Idaho.

Burning occurred on 18 days in the 2003 season. There were 11,032 acres registered. Of these, 7,561 acres were burned. There were 106 complaints received regarding burning in Boundary county. Of these, 89 were from Creston, British Columbia, Canada. Thirteen were from other areas in British Columbia. Four were from Boundary County. General complaints comprised 57 calls, information requests twelve calls, smoke complaints 34 calls, and support comments comprised two calls.

The primary smoke management challenge in Boundary County is the impact of the terrain on smoke behavior. The narrow valley exhibited erratic winds that often made it difficult to accurately predict the direction of smoke plumes. In addition, technical difficulties prevented the ISDA smoke coordinator from having real-time access to the weather and air quality data. Forecasts provided by the contract meteorologist were not refined enough to make the field-specific decisions that were necessary due to the airshed's unique topography. Recommendations for next season include improved technology for accessing the internet and the Kootenai Tribe of Idaho's air quality data, expansion of the Clear Sky smoke plume prediction tool to include Boundary County, additional monitoring capabilities to accommodate local smoke impacts (particularly near the British Columbia border), improved education and outreach by providing program training to the growers prior to the growing season, as well as working cooperatively with the British Columbia Ministry of Water, Land and Air Protection to address cross-boundary issues.